

**The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD – this document) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.**

Ohio Space Grant Consortium  
Lead Institution: Ohio Aerospace Institute  
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Consortium URL: <http://www.osgc.org/>  
Grant Number: NNX10AI39H

### **PROGRAM DESCRIPTION**

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Ohio Space Grant Consortium is a Designated Consortium funded at a level of \$575,000 for fiscal year 2014.

### **PROGRAM GOALS**

The Ohio Space Grant Consortium has the following goals for FY2014 in support of the NASA Office of Education goals. The OSGC 5-Year Strategic Plan, Vision, Mission, Goals and SMART Objectives were redefined, approved and implemented by the OSGC Executive Committee in January, 2010.

**Goal 1** – To develop a STEM workforce in Ohio through a comprehensive scholarship and fellowship program at universities and colleges, through internships and educator development programs, and to increase workforce diversity by support of underrepresented groups in higher education to prepare individuals for employment in various NASA-related STEM careers.

**Specific:** The intent of the scholarship/fellowship programs is to increase the workforce in STEM areas, particularly with regard to female and underrepresented groups.

**Measurable:** For the combined scholarship/fellowship program our goal is to have 40% female (*Percentage was changed from 50% to 40% to reflect the correct NASA target (November, 2011).*) and 20% underrepresented students. 95% of undergraduate scholars

will graduate, and 80% will enter STEM fields (education or workforce). 80% of Graduate fellows will graduate within 2 years of the end of the fellowship period and enter STEM fields. Award 1 special minority fellowship annually. Award 2 additional underrepresented scholarships at each OSGC MSI annually. Annually track students who receive significant support through graduation, or until “the next step” via Exit Forms.

**Goal 2** – To support and integrate research and education for faculty and post-doctoral researchers within the State of Ohio through collaborations between universities and with NASA Centers, OSGC affiliates, the State of Ohio, the OAI, the Air Force Research Laboratory, and STEM-related industry.

**Specific:** We will support seed grants for young faculty at Ohio universities and colleges to enable them to strongly compete for substantial national awards. We will specifically encourage proposals from underrepresented and female faculty.

**Measurable:** Each year, OSGC will support at least two seed grants for faculty. Within two years of the OSGC award, 50% of our awardees will leverage our support to a more substantial national funding.

**Goal 3** – To encourage the development of new courses and programs that will broaden the availability of STEM curriculum throughout the State of Ohio, especially in rural areas, at Minority Serving Institutions (MSIs) and community colleges, and strengthen existing STEM education programs at affiliate member’s schools through support for curriculum and course development.

**Specific:** OSGC will support course development in STEM areas of particular interest to NASA, particularly at those colleges and universities which are not dominant research institutions, and which serve mainly minority and rural populations. In some cases this will be best achieved by linking two or more schools together in a collaborative effort.

**Measurable:** Under current funding levels, we will fund at least two curriculum grants during the upcoming five-year cycle.

**Goal 4** – To promote hands-on student projects and activities primarily in higher education activities that will excite, inspire, and engage diverse student populations to become involved in STEM education, ultimately to be integrated into the NASA pipeline and STEM career paths.

**Specific:** We will fund student-oriented, hands-on projects at several schools within the OSGC network. Results of these projects will be disseminated to the OSGC affiliates, thus leveraging also with Goal 4.

**Measurable:** A minimum of two projects each year will be funded. At least one of these will be a collaborative effort between two or more schools, and at least one will be oriented toward a rocket or space project.

**Goal 5** – To work within our affiliate network with a focus on Minority Serving Institutions (MSIs) and community colleges, to ensure that NASA and STEM opportunities are presented, encouraged, and awarded in accordance with respect for the diverse population of Ohio.

**Specific:** We will strive to increase interest and activity within the Ohio MSIs and community colleges in STEM higher education and research activities by earmarking additional funding for student and faculty projects at these institutions.

**Measurable:** We will create and fund at least one student intern each year either at an MSI to work with a research faculty at an Ohio university. Community college

scholarships will be specifically directed toward students who wish to matriculate to a higher education facility.

**Goal 6** – To encourage and promote K-12 student interest in pursuing higher education STEM curricula by supporting the development of qualified STEM educators through scholarships and workshops, and provide access to NASA educational materials.

Specific: OSGC will fund College of Education scholars who are interested in STEM careers in K-12 education, and connect them with NASA K-12 educational resources. We will encourage higher education schools with student-oriented projects to work with K-12 students to integrate them into aspects of these projects.

Measurable: We will fund a minimum of 12, \$1,000 scholarships (*Increased to \$2,000 in FY2010*) each year, using an application process through the education departments at OSGC affiliates. Each scholar will be funded to attend a NASA-sponsored workshop, and given access to NASA educational materials.

**Goal 7** – To encourage the development and focus of outreach programs, courses, teacher professional development, and research projects that align with current areas of emphasis within NASA priorities, as well as the needs of the State of Ohio.

Specific: OSGC will interact and liaison with organizations such as museums, observatories, Greater Cleveland Partnership and others, working to improve the STEM educational opportunities of Ohio.

Measurable: We will fund organizations needing minor funding with “mini-grants” to promote their education and outreach activities. We will support other organizations and volunteer our time to promote their activity when consistent with OSGC spectrum of activities.

### **PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, and 3)**

1) **Malia B. Amling** (female), FY2014 Senior Scholar; graduated May, 2014, B.S., Electrical Engineering, Cedarville University; currently, a Fuel Systems Controls Engineer with Cummins, Inc. *“The scholarship allowed me to grow as an engineer through collaborating on projects with faculty on research not readily available at my school. The funding helped me to focus on my engineering education, and the Symposium allowed me to learn from other students, while also giving me practical experience with presentation skills.”* ***Aligns to Outcomes 1 and 2.***

2) **Peter E. Siegfried**, FY2014 Senior Scholar, graduated May, 2014, B.S., Physics/Mechanical Engineering, Miami University; pursuing Ph.D. at the University of Colorado in Boulder. *“I will be furthering my education to pursue a PhD in Physics. The opportunities provided have made the last year of my studies fulfilling and were key to my acceptance in graduate school. Fundamental research is something I will pursue as a career as a result of the scholarship.”* ***Aligns to Outcomes 1 and 2.***

3) **Anthony J. Rader**, FY2014 Education Scholar, graduated May, 2014, B.S., Biology, Ohio Northern University, currently, a Science Teacher at Liberty-Benton High School. *“The scholarship was a great experience not only for my continuing education, but also for gaining vital research experience for my future career. I learned a lot from my research and will be able to use the NASA lesson I created in my classroom.”*

***Aligns to Outcomes 1 and 2.***

### **PROGRAM ACCOMPLISHMENTS**

**Outcome 1:** *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals: (Employ and Educate)*

OSGC funded 98 "Significant" student awards in FY14 – 90 scholarships and fellowships, 3 Research Infrastructure (RI) students and 5 Higher Education (HE) students (interns at NASA Centers). Of the 98 awards, 27 were made to underrepresented minority (UM) students (27.55%) which exceeded the 19.55% OSGC target, and an increase of 1.89% from FY2013 (25.66%); 38 awards to females (38.78%) which did not meet the 40% target, but was a 3.38% increase from FY2013 (35.40%). OSGC's Fellowship (Master's/Doctoral) and Scholarship Program (Junior / Senior / Community College) provides financial support to students pursuing STEM degrees. Pre-service teacher scholarships are given to students pursuing licensure in Science/Math. Two scholarships are awarded to honor 2 Directors who passed away. All awards are competitive and offered to U. S.' citizens; UM students, women, and persons with disabilities are encouraged to apply. A key feature of the program is an emphasis on exposure to research relevant to NASA under the direction of a faculty mentor. Awardees present their research or educational lesson plan (poster or PowerPoint) at the annual Student Research Symposium held in April at OAI. Students also write a report which is published in the *Student Research Symposium Proceedings*. OSGC supported 5 interns (2 females) at NASA Centers. All supported students are successfully tracked.

- Fellowships – Awarded 7 fellowships (4 Doctoral and 3 Master's) to students enrolled at an Ohio university pursuing a STEM field of graduate study and also conduct research relevant to NASA. Doctoral fellowships may be renewed for up to 3 years, and Master's for an additional 6 months.

- Scholarships – Awarded 83 scholarships (63 Junior and Senior; 6 Community College; 14 Pre-Service Teachers). Junior, Senior, and Community College students conduct research under the supervision of a faculty mentor. Pre-Service teachers create a future lesson plan using NASA education materials under the supervision of a faculty mentor.

- Internships – Supported 5 internships (2 females) in Summer, 2014, at 4 NASA Centers (i.e., Glenn, Goddard, Langley, and Marshall)

- Higher Education – OSGC funded multiple SICHOP (Student-Innovative-Creative-Hands-on Project) grants (i.e., Rocket/Robotics/UAS/Balloon Satellite teams; provided travel funds for students presenting at technical meetings,

- Research Infrastructure – OSGC funded 3 undergraduate students (all UM students) to work and train on methods of scientific experiments on radiation of sample materials, cooling pools, and theoretical aspects of nuclear reactions at the Fermi Nuclear Power Plant (Monroe, MI). Students collected data for the sample radiation and power generation, then performed the analysis of the data and finalized reports. ***Met or exceeded OSGC Goals 1, 4, 5, and SMART Objectives, except for 40% female target. Addresses NASA Outcome 1: Objectives 1.1, 1.2, 1.3, 1.4, 1.5; Strategic Goal 5, Outcome 5.1, Obj. 5.1.2; Strategic Goal 6, Outcome 6.1, Obj. 6.1.1, 6.1.2; Outcome 6.2, Obj. 6.2.1.***

**Outcome 2:** *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty: (Educate and Engage)*

- Other Higher Education programs include: curriculum grant at Wright State (UM female) for "Minority Engineering Mentorship Program"; continuing grants at: Miami University, "Project High Flight"; Wright State (one UM faculty) "Manufacturing Engineering Program Development at the Lake Campus"; Campus Representative (CR)

support; student poster presentation at the Great Midwest Regional meeting and others; University of Cincinnati (UC), “Gambol Hybrid Rocker Lander/Battle of the Rockets”; Ohio Northern, “SAE Aero Design Competition”; Lorain County Community College and UC competed in the “1st Annual Autonomous Aerial Vehicle Competition” in Dayton; Wright State, “NASA Lunar Mining Robot”; and “Ohio State Rocket Team”.

•Precollege programs include: Supported pre-service teacher workshop conducted by Glenn Research Center (GRC) Educational Programs Office; iSPACE STEM Educator Academy; awarded following mini-grants to Ohio K-12 teachers for innovative STEM programs utilizing NASA content: Huron City Schools, “littleBits Connect Us to Physical Science”; Great Oaks Institute, “Engineering Robotics Club”; Benjamin Logan High School, “ScienceFusion”; Madeira Elementary School, “Model Rocketry: Fueling Potential & Accelerating Achievement”; Norwalk Catholic School, “Team America Rocketry Challenge (TARC)”; St. Vincent-St. Mary High School, “NASA SL”; Bishop John King Mussio Central Elementary, “Return to the Moon”; EHOVE Fablab, “By Design You Are In Control U-Control Aeronautics”; “Flight Camp/University of Cincinnati for High School/Middle School”.

***Exceeded OSGC Goals 2, 3, 6, and SMART Objectives, NASA Outcome 2: Obj. 2.1, 2.3, 2.4; NASA Strategic Goal 6, Outcome 6.1, Obj. 6.1.1, 6.1.2; Outcome 6.2, Obj. 6.2.1, Outcome 6.4, Obj. 6.4.1.***

**Outcome 3:** *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA’s mission: (Engage and Inspire) Award Informal Education Innovation Proposal (IEIP) grants at: The University of Toledo, “Inspiring Student Science Interest Through Real-World Climate Change Projects”; Cincinnati Observatory Center, “Star Gazers”; FIRST Robotics Competition (Buckeye Regional); Case Western Reserve University, “Elementary Science Olympiad December Workshop, Northeast Ohio Regional Science Olympiad, and Elementary Olympiad”; Cleveland State/Cuyahoga Community College, “STEM-u-late Your MIND STEM FAIR”.* ***Exceeded OSGC Goal 7 and SMART Objectives, NASA Outcome 3: Objectives 3.1, 3.3; NASA Strategic Goal 6, Outcome 6.1, Obj. 6.1.1, 6.1.2; Outcome 6.2, Obj. 6.2.1, Outcome 6.4, Obj. 6.4.1.***

*This information may be revised when additional reporting information is collected and reported into OEPM) system.*

## **PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES**

•**Diversity:** Of the 27 Affiliates, 2 are MSIs. Diversity for the Affiliates (Interim Director included in Wright State) includes 6 UM members (22.22%) and 6 females (22.22%). Sixteen individuals comprise the OSGC Executive Committee which includes 6 UM members (37.50%) and 2 females (12.508%). The OAI Representative and the OSGC Program Manager are both females. Diversity is a priority in all OSGC programs. In Fellowships, HE, and RI student activities exceeded the 19.55% target; the UM students’ total was 27.55% (an increase of 1.89% from FY2013 (25.66%).

•**Minority-Serving Institution Collaborations:** Two universities are designated as MSIs: Central State University (CSU) and Wilberforce University (WU). Both are federally recognized as HBCUs (CSU was designated as a Land-Grant Institution in February, 2014). Both are charter affiliate members. Five scholarships are awarded to

UM STEM students at each school. WU collaborated with the Fermi Nuclear Power Plant and students conducted experiments on radiation of sample materials, cooling pools, and theoretical aspects of nuclear reactions. Students collected data for the sample radiation/power generation, and performed analysis of the data and finalized reports. WU also collaborates with OSU on the Ralph Steckler “Nuclear Power for Space Colonization Research and Technology Development”. CSU has an active balloon satellite program.

•**NASA Education Priorities:**

- Authentic, hands-on student experiences in science and engineering disciplines – Student experiences include: funded 5 interns at NASA Centers; exposed 3 WU UM students to industry/university research; SICHOP grants and other activities listed previously highlighting student activities in Higher Education.
- Engage middle school teachers in hands-on curriculum – Continue to provide training/resources to OSGC pre-service teachers through NASA-led workshops. Support for “Flight Camp/University of Cincinnati for High School/Middle School” (Kelly Cohen and Amy Jameson will be presenting at the Spring, 2014, SG Meeting in DC); iSPACE STEM Educator Academy; Benjamin Logan Middle School, “ScienceFusion”; Huron City Schools, “littleBits Connect Us to Physical Science”.
- Summer opportunities for secondary students on college campuses – Wright State (Lake Campus), “Girls Just Wanna Have STEM”, CAMP Gems and Engineering Pathways Camp, Ohio Northern, Women in Engineering Camp, University of Dayton.
- Community Colleges – Awarded funding from NASA for “CC-STARS! (Community College – STEM Training and Retention of Students!)”. Awarded 6 community college scholarships. Added Cincinnati State Technical and Community College as a new OSGC academic affiliate. Award SICHOP grants for student UAS projects; provided students/faculty with travel funds to present at technical meetings.
- Aeronautics research – Continued research support to the SIERRA Project at the University of Cincinnati (UC). Funded Brian M. Katona, NASA Aeronautics Academy at Langley and Caitlyn M. Rodomsky (female), at the Aeronautics Academy at Glenn. The UC students (1 female) are performing the following aeronautics research: “A MATLAB-Based Fuzzy Logic System in Checkers”; “Potential for Increased Efficiency using Supercritical Carbon Dioxide as a Working Fluid”; “Hydrofoil Design Tool for the Energy Ship”; “Using Intelligent Systems for Object Recognition in Thermal Imaging Analysis”. Kent State (1 UM female, 1 UM male) “NextGen: The Future of Air Traffic”; “Alternative Propulsion System for the Aviation Industry”. The University of Akron: “Magnus Effect and Its Plausible Impact on Rocket Propulsion to Achieve Greater Altitudes”; Ohio State: “Control Authority of Nanosecond Pulse Driven DBD Plasma Actuators Over an Airfoil in Fully-Reversed Condition; Sinclair Community College: “Aviation Technology and Technical Studies in Unmanned Aerial Systems/Geographic Information Systems.”
- Environmental Science and Global Climate Change – The University of Toledo, “Inspiring Student Science Interest Through Real-World Climate Change Projects.”
- Enhance the capacity of institutions to support innovative research infrastructure activities – Priority is given to the MSIs and young faculty (UM and females) who focus their research toward NASA priorities when applying for an OSGC seed grant.

## IMPROVEMENTS MADE IN THE PAST YEAR

- Appointed Dr. P. Ruby Mawasha (UM male) as the new Interim Director to replace Dr. Gary Slater who announced his retirement in October, 2014.
- Submitted an improvement plan to NASA Headquarters to meet the 40% female goal in OSGC programs in December, 2013, which included Goals, SMART Objectives, and a timeline consistent with the goals stated in our previous proposal to accomplish this.
- Added Cincinnati State Technical and Community College University as a new Affiliate in October, 2013. Professor David Simmermon serves as the Campus Representative.
- OSGC was awarded Augmentation funding for “CC-STARS! (Community College – STEM Training and Retention of Students)”.

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

•**Lead Institution** – The Ohio Aerospace Institute (OAI) is the lead institution, (501 (c) (3) non-profit organization, located in Cleveland, where the OSGC Program offices are also located. OAI’s mission is to build Ohio's aerospace economy. OAI is an active participating member providing financial, supplementary, and website support as part of the required match.

•**Membership** – 27 Affiliates (18 University Affiliates, 8 Community College Affiliates (**Cincinnati State Technical and Community College was added in FY2014**), and OAI). Sixteen individuals from University Affiliate Members comprise the OSGC ExComm with full voting rights (12 are from the original Ohio universities with Colleges of Engineering). OSGC also collaborates with the College of Education at OSGC-member universities to recruit and award Education scholarships (for pre-service teachers) to students seeking certification in Science and Math.

### **Affiliate Members and OSGC Executive Committee (ExComm) Members (16):**

•**Air Force Institute of Technology (AFIT)** – Federal Institution Ph.D. degree-granting university, Dr. Alan L. Jennings (former Doctoral Fellow) serves as Campus Representative (CR) and member of the ExComm.

•**Case Western Reserve University** – Private Ph.D. degree-granting independent research university. Dr. Jaikrishnan R. Kadambi serves as CR and member of the ExComm.

•**Cedarville University** – Private four-year degree-granting university. Dr. Robert Chasnov, P.E., serves as CR and member of the ExComm.

•**Central State University** – Public Historically Black four-year degree-granting university; designated as a Land-Grant Institution in February, 2014. Mr. Gorgui S. Ndao (UM male) serves as CR and member of the ExComm.

•**Cleveland State University** – Urban Public Ph.D. degree-granting research university. Ms. Rose Begalla (UM female) serves as CR and member of the ExComm.

•**Kent State University** – Public Ph.D. degree-granting research university. Dr. Joseph Ortiz (UM male) serves as CR and member of the ExComm.

•**Miami University** –Public Ph.D. degree-granting research university. Dr. Timothy M. Cameron serves as (CR) and member of the ExComm.

•**Ohio Northern University** – Private four-year degree-granting comprehensive university. Dr. Jed E. Marquart, P.E., serves as CR and member of the ExComm.

•**The Ohio State University** – Public Ph.D. degree-granting research university. Dr. Mo Samimy serves as CR and member of the ExComm, and hosts all OSGC meetings.

- Ohio University – Public Ph.D. degree-granting university. Dr. Shawn Ostermann serves as CR and member of the ExComm with full voting rights.
- The University of Akron – Public Ph.D. degree-granting research university. Dr. Craig C. Menzemer serves as CR and member of the ExComm.
- University of Cincinnati – Urban Public Ph.D. degree-granting research university. Dr. Kelly Cohen serves as CR and member of the ExComm.
- University of Dayton – Private Ph.D. degree-granting university. Dr. John G. Weber serves as CR and member of the ExComm.
- The University of Toledo – Public Ph.D. degree-granting research university. Dr. Lesley M. Berhan (UM female) serves as CR and member of the ExComm.
- Wilberforce University – Private Historically Black four-year degree-granting university. Dr. Edward Asikele (UM male) serves as CR and member of the ExComm.
- Wright State University – Public Ph.D. degree-granting comprehensive university. Dr. P. Ruby Mawasha, P.E. (UM male) is the OSGC Interim Director and also serves as Wright State’s Campus Representative and member of the ExComm.

**Participating Institutions (2):**

- Marietta College – Private four-year degree-granting university). Professor Ben W. Ebenhack serves as the Campus Representative.
- Youngstown State University – Urban Public Ph.D. degree-granting urban university). Dr. Hazel Marie (female and former OSGC Fellow) serves as the CR.

**Community Colleges (8):**

- Cincinnati State Technical and Community College – Associate degree-granting community college. Professor David Simmermon serves as the Campus Representative.
- Columbus State Community College – Associate degree-granting community college. Professor Jeffery M. Woodson (UM male) serves as the CR.
- Cuyahoga Community College (Tri-C) – Associate degree-granting community college. Dean David Frazee serves as the Campus Representative.
- Lakeland Community College – Associate degree-granting community college. Dean Steven Oluic, Ph.D., USA (ret.) serves as the Campus Representative.
- Lorain County Community College – Associate degree-granting community college). Dean Rosa E. Rivera-Hainaj, Ph.D. (UM female), serves as the Campus Representative.
- Owens Community College – Associate degree-granting community college. Dean Glenn Rettig serves as the Campus Representative.
- Sinclair Community College – Urban Associate degree-granting community college. Dean Lorraine A. Kapka, P.E., serves as the Campus Representative.
- Terra State Community College – Associate degree-granting community college. Mr. Andrew G. Carroll serves as the Campus Representative.

**Other Partners:**

- Government: NASA Centers (especially Glenn Research Center [Educational Programs Office Chief Robert LaSalvia, Education Specialist Susan Kohler, University Programs Officer M. David Kankam (UM male)]; Air Force Research Laboratory, and Wright-Patterson Air Force Base. All are involved partners and attend meetings/events regularly.
- Industry: ArcelorMittal, Cornerstone Research Group, Etegent Technologies, L-3, Sierra Lobo, ZIN Technologies, and Orbital Research. Industry partners have provided support for OSGC student internships.

- Foundations: Nordson Foundation and the Nord Family Foundation have provided financial support for OSGC scholarships and fellowships.
- State of Ohio: Choose Ohio First (Ohio Board of Regents) has provided financial support for scholarships and fellowships.
- Education Outreach: Cincinnati Observatory Center, Cleveland Museum of Natural History, Drake Science Center, Cleveland Museum of African American History. All Education Outreach partners are eligible for OSGC grants.

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